THE TONGUE OF THE CAPE MAY WARBLER.

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IN SEEKING to unravel the tangled skein of passerine birds, and to straighten out its intermingled loops, the taxonomist has sought to avail himself of every possible character, and, from the development of the embryo to the markings on the egg shell, little has been left untried.

While the character of the tongue has not been overlooked, comparatively little use has been made of it, partly on account of the time and trouble required for the careful study of this organ, and partly perhaps from a doubt as to its value. In his 'Review of North American Birds' Prof. Baird, in treating of the family Sylvicolidæ, compared the tongues of several species of this group with those of several species of Cœrebidæ, drawing particular attention to the tongue of *Dendroica tigrina* and, mainly on this character, basing the genus *Perissoglossa*.

Quite recently Dr. Gadow, in his paper on the 'Structure of Certain Hawaiian Birds,' has laid considerable stress upon the shape and structure of the tongue, using it as the principal character of one of his alternative keys to the arrangement of the families of birds therein discussed. Both Prof. Baird and Dr. Gadow have dwelt to some extent on the tongue of the Cœrebidæ, the one using it to unite these birds with the Sylvicolidæ, the other to ally them with the Drepanididæ.

In this connection arise the questions: What is the exact taxonomic value of the tongue? and how constant is its pattern in any given group? To these I would add another query: To what extent is the food of a bird indicated by the shape of the tongue?

It is much easier to ask these questions than to answer them, and I am very far from being ready with a reply; still, having had occasion to recently examine the tongues of a number of birds, I am at least partly prepared with a response as to my own ideas on the subject. It would seem that the soft parts of birds would naturally be more plastic than the hard, and that while the bone yields more or less to the pull of the muscle and

is changed by internal and external conditions, that such organs as the tongue and viscera would be more easily influenced, especially by any change, either from choice or necessity, in the character of a bird's food. If this be so, we should find differences between these parts in nearly related birds, while at the same time it should not surprise us to discover resemblances between them among forms separated by space, or skeletal structure, but whose food habits are similar.

Cœreba cœrulea and *C. cyanea* are certainly near relatives, and their skulls are so much alike that I doubt my ability to tell them apart, but their tongues, although the same in structure, differ so decidedly that they may be distinguished from one another at a glance. Unfortunately, for lack of material, I can carry the subject no farther and am unable to say whether or not the tongue of *cœrulea* is typical of the plainer colored species. Now about as far from America as one can readily get, in New South Wales, we find that one of the Honey-suckers (*Acanthorhynchus tenuirostris*) has a tongue structurally like that of *Cœreba*, but elaborated and refined to a greater degree, being more slender, more tubular, and more finely feathered. Judged by cranial characters the two birds are widely separated, for, as Dr. Parker has pointed out, the palate of *Acanthorhynchus* has a feature in the relations of the premaxillaries and palatines found in the Ostrich but exceptional higher up the scale. Coming back to America, to the genus *Dendroica*, we will find that while the tongues of various species are constructed on the same plan, that there is great specific variation in the execution of details, the extremes, so far as I have examined, being marked by *Dendroica maculosa* and *D. tigrina*, and that while these extremes are widely separated, yet the gap between them is bridged over by other species which show intermediate stages. The Tanagers, too, show considerable diversity in their tongues, some being thick and fleshy, others thin and horny, while there is much less uniformity of plan in these birds than in the Warblers. While these facts are entirely too few to form the basis of a reply to the question, What is the value and constancy of pattern of the tongue? they seem at least to hint that while there may be a certain general structural plan in a given group of birds, that this plan is subject to great specific varia-

tions in its details, and cannot be too surely relied on, since it is liable to be copied by outsiders.

Next as to the relationship between food and tongue. The Sandwich Islands Drepanididæ have a most perfect tubular tongue, such as one might make on a gigantic scale by curling up the edges of a long slip of paper until they meet, and then tying them firmly in place. These birds (some of them at least) have, like the Meliphagidæ, a suctorial apparatus, so that if they do not feed on nectar it is not for lack of ability to do so. And yet some of these birds, as their stomachs testify, feed on fruit and some on spiders and insects. *Certhiola* has a brushy, twisted tongue, such as we find in some of the Meliphagidæ, but while these last are said to be honey-suckers *par excellence*, *Certhiola* seems to have a decided liking for insects.

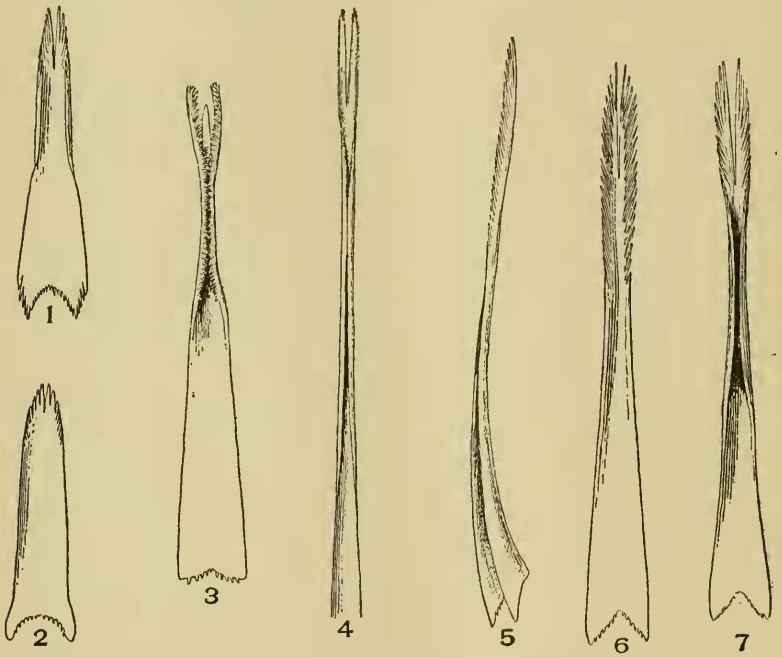
In the genus *Cœreba* (or *Abelorhina*) as well as in *Glossoptila*, the tongue seems admirably fashioned for catching insects or sucking honey, and these birds feed on berries. So with the Hummingbirds, which have a good suctorial tongue and yet feed principally on insects, although they may perhaps have honey for dessert.

Just here I wish to forestall a possible criticism. It is quite likely that in the cases just mentioned the birds may feed at some seasons on fruit, and at others on insects, but the point I would make is that even if they do, the tongue is no certain guide to the nature of the birds' food.[1]

Coming finally to *Dendroïca tigrina*, whose tongue has been used as a peg on which to hang this paper, if any one will take the trouble to compare the figure accompanying this paper—which was made from a specimen collected by my friend Mr. William Palmer—with figure 5, page 163, 'Review of North American Birds,' he will find that they do not agree with one another. If comparison is made with figure 4 of the same work, it will be seen that, making allowance for the personal equation of the two draughtsmen, the figures agree very well. If the tongues of *Cœreba* herein figured (Fig. 5–7) be compared

[1] Mr. F. M. Chapman (Bull. Am. Mus. Nat. Hist. VI, p. 26) says that in Trinidad *Arbelorhina cærulea* and *A. cyanea* feed on the blossoms of the *bois immortel*, but he does not say that he examined the stomachs of any birds. Query: Were the birds after nectar or insects?

with 3 and 5 (same work) their structural resemblance will be evident, and the conclusion is unavoidable that, as at Babel, there has been a confusion of tongues, and that the principal character of the genus *Perissoglossa* has originated in a mistake. Granting, however, that the tongue had been as figured, it hardly seems that the characters would have been sufficiently solid to form the foundation for a genus.



ENLARGED FIGURES OF TONGUES OF BIRDS: 1. *Dendroica tigrina;* 2. *D. maculosa;* 3. *Glossoptila campestris;* 4. *Acanthorhynchus tenuirostris;* 5 and 6. *Cœreba cyanea;* 7. *C. cærulea.*

It may be said further that the tongue of *Certhiola* is also wrongly figured in the 'Review of North American Birds,' for it is not fimbriated, but brushy and twisted. Unfortunately such errors are bound to occur, and we must ever be on the watch for them; and I will only say in conclusion that if any one thinks them inexcusable, let him try to dissect and figure a dozen similar specimens and the crime will perhaps seem to have some extenuating circumstances.